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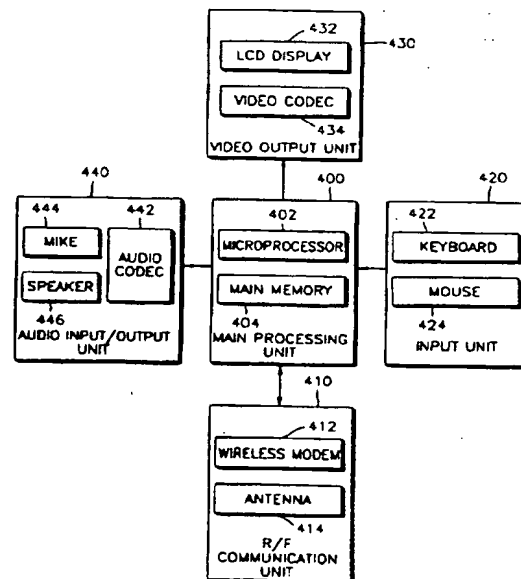WO 96/35288 A1

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(54) Abstract Title
Mobile Communication Terminal

(57) A mobile communication terminal which performs a limited mobile computing function in addition to functions provided by a mobile video phone, and a software platform thereof, are provided. The mobile communication terminal can execute user application programs received from a network, as well as performing functions provided by an existing mobile video phone. Thus, a small, economic mobile communication terminal is obtained.

FIG. 4

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FIG. 1

FIG. 2

FIG. 3

SOFTWARE PLATFORM

300

WEB BROWSER MANAGEMENT UNIT

312

REAL
TIME
PROCESSING
KERNEL

314

NETWORK
MANAGEMENT
UNIT

316

INPUT/OUTPUT
MANAGEMENT
UNIT

318

FILE
MANAGEMENT
UNIT

310

320

NETWORK
APPLICATION
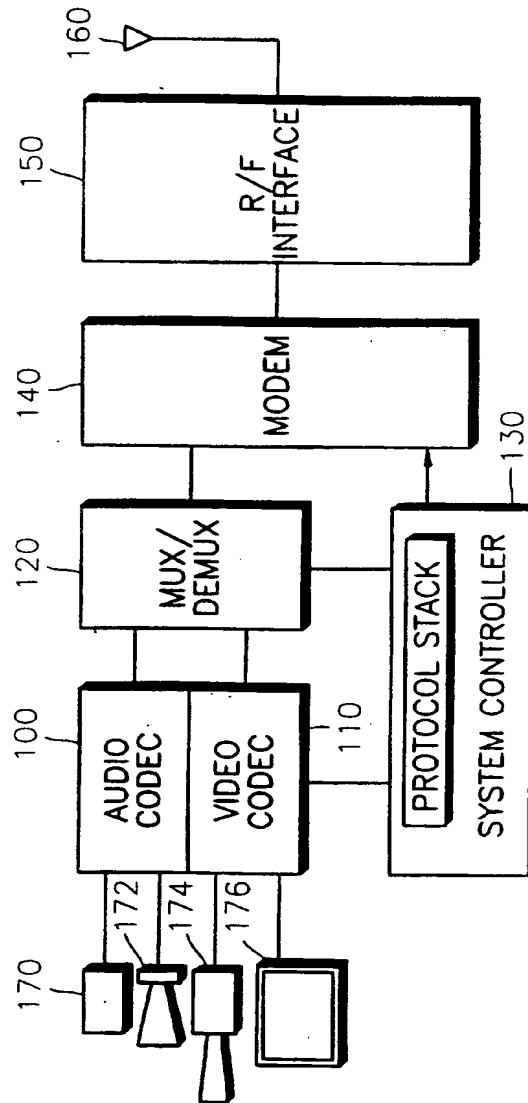PROGRAM
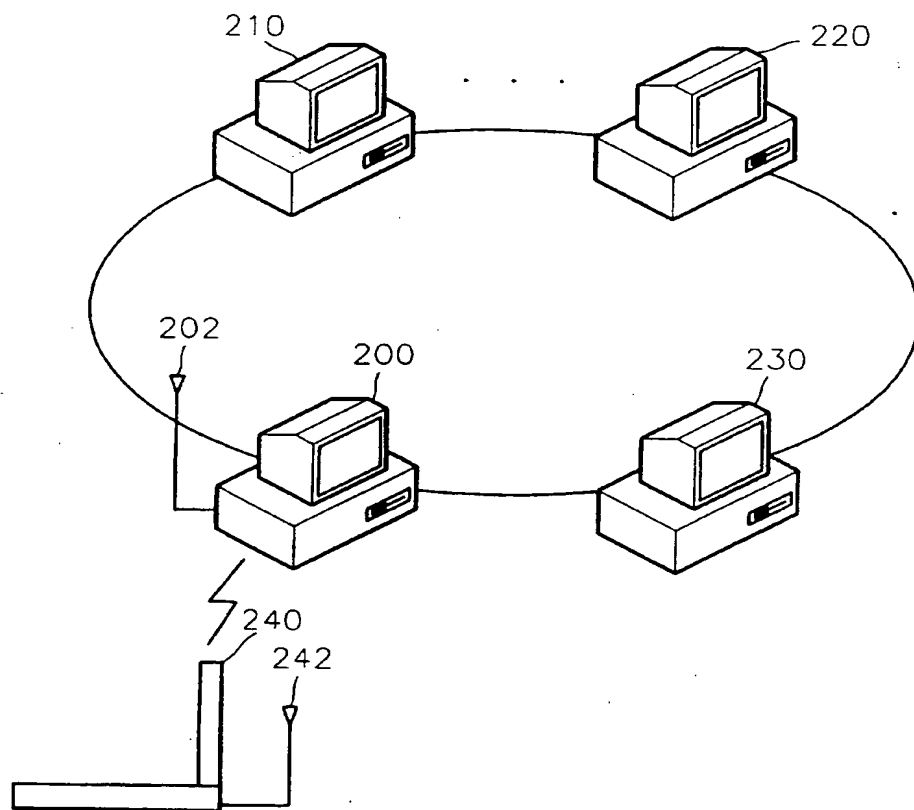VIRTUAL MACHINE

330
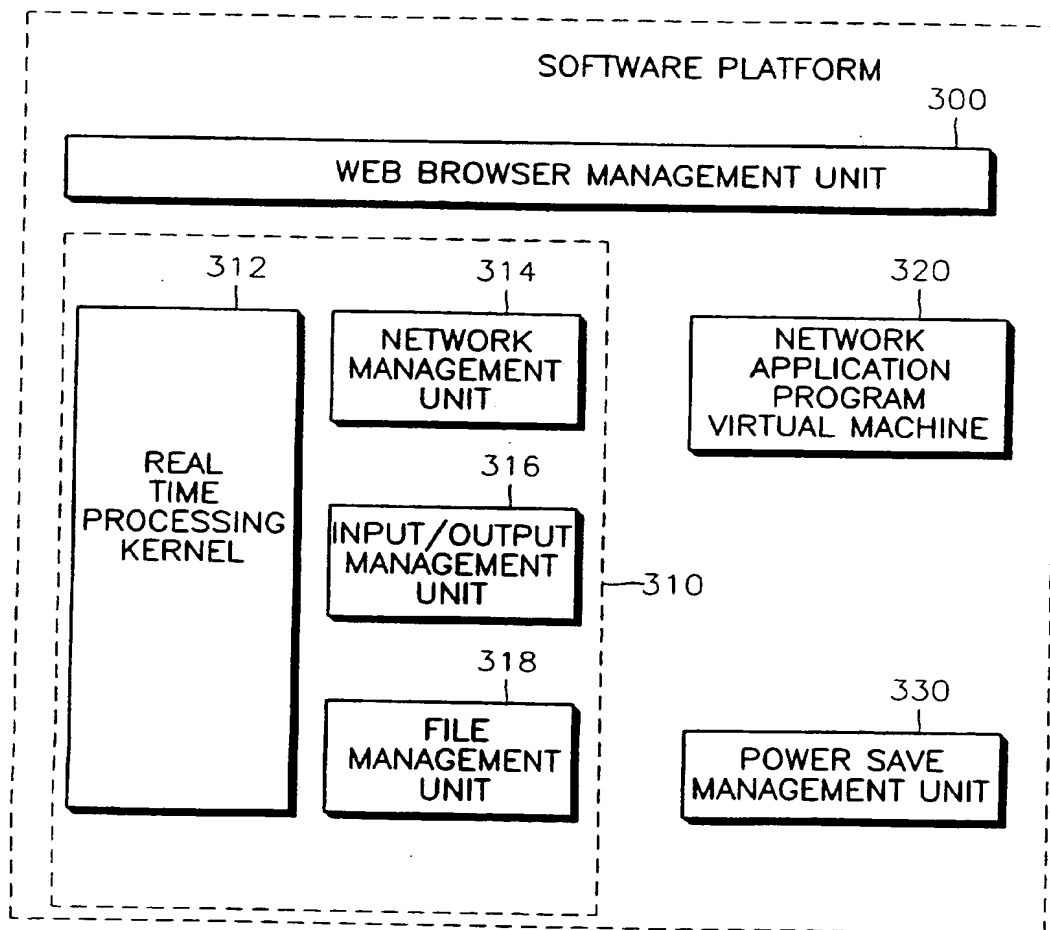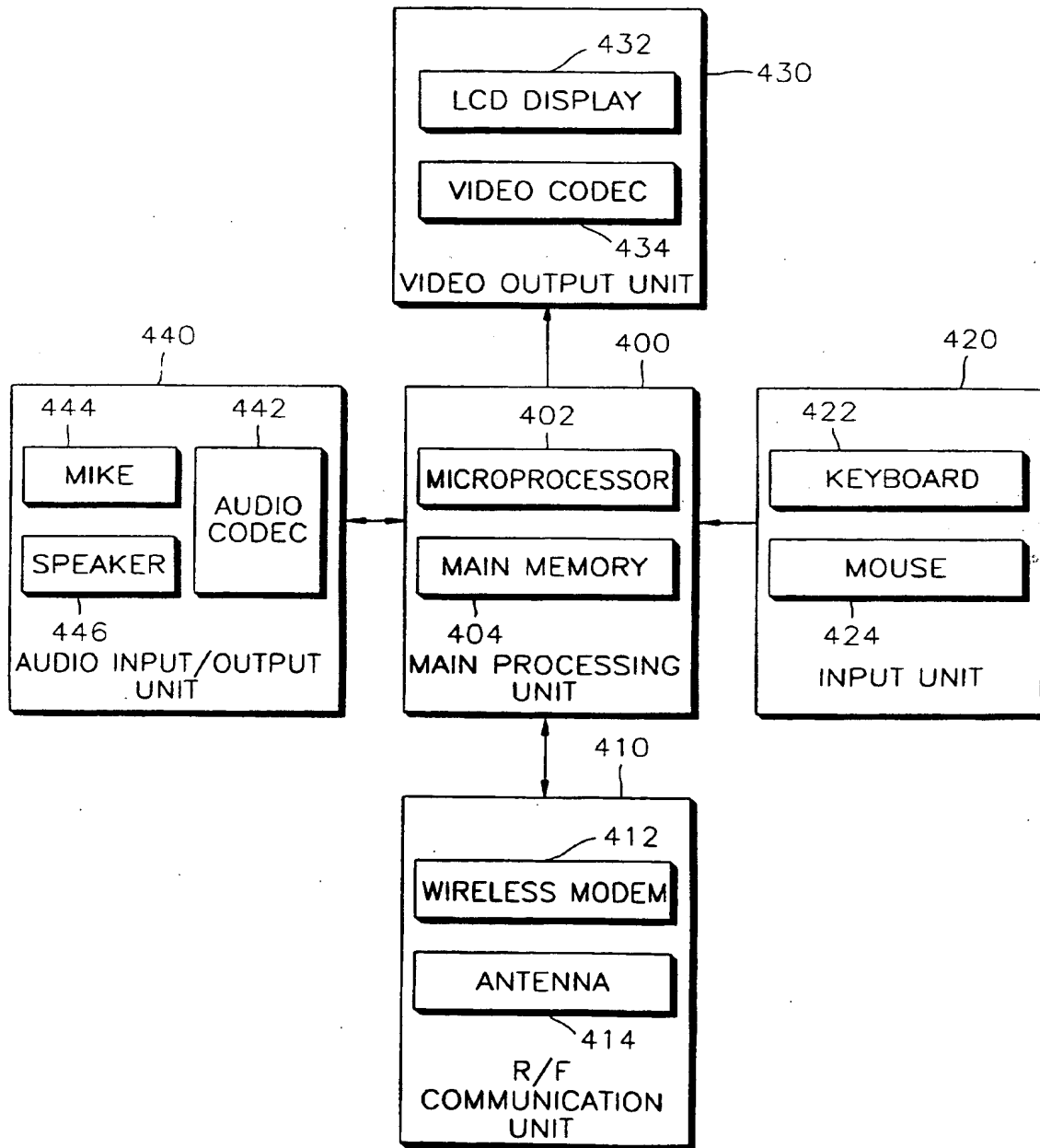
POWER SAVE
MANAGEMENT UNIT

FIG. 4

- 1 -

MOBILE COMMUNICATION TERMINAL AND SOFTWARE PLATFORM THEREOF

5   The present invention relates to a mobile communication terminal, and more particularly, to a mobile communication terminal having a mobile video phone function and also a limited mobile computing function, and a software platform thereof.

10   Recently, a mobile computing system for processing non-audio digital data using a high-speed broadband wireless communication network has been the subject of much development. A mobile video phone for processing and transmitting audio and video data is also being developed.

15
         However, in a conventional mobile video phone and a conventional mobile computing system, users of the mobile video phone cannot sufficiently use various application programs provided by the mobile computing system.

20
         That is, since the existing mobile video phone has significantly limited hardware, it cannot execute various application programs which are required by users.

25   In order to add the mobile video phone function to the existing mobile computing system, additional hardware or software for video/audio processing must be provided. Furthermore, a complicated I/O (input/output) unit, a large-scale software platform, etc. which serve to support

30   an existing wireless network computing function, impose a burden on the users of the existing mobile video phone.

         In summary, the software platform of the conventional video phone has a limit in receiving various services on

35   a current network, because of its closed architecture.

The architecture of the mobile computing system, from the perspective of a computer system field, is based on a computing system architecture, and thus its structure is too large for stand-alone special functions such as mobile
5   video phone functions.

With a view to solve or reduce the above problems, an aim of preferred embodiments of the present invention is to provide a mobile communication terminal which can
10 download and execute user application programs from a network, as well as performing functions provided by an existing mobile video phone, by restrictedly combining the open system architecture of a wireless network computing system with the mobile video phone, and a software
15 platform thereof.

According to a first aspect of the invention, there is provided a mobile communication terminal having a wireless connection to a server system, comprising: a main
20 processing unit for receiving application programs and network application programs each for processing video and audio data from said server system, and for executing the downloaded programs; an R/F communication unit which is connected to said main processing unit and includes a
25 wireless modem and an antenna, for communicating with said server system by wireless communication; an input unit connected to said main processor, for receiving instructions from a user; a video output unit for outputting video data processed by said main processing
30 unit; and an audio input/output unit for receiving sound from a user, generating digital audio data and transmitting the digital audio data to said main processing unit, and receiving digital audio data from said main processing unit and generating and outputting sound.
35 sound.

Preferably, said main processing unit comprises: a microprocessor; and a main memory for storing programs and data to be processed by said microprocessor.

5   Said input unit may include a keyboard and a mouse.

Said video output unit may include an LCD display and a video codec.

10   Said audio input/output unit may include a microphone, a speaker and an audio codec.

According to a second aspect of the invention, there is provided a software platform of a mobile communication
15   terminal, operating a mobile communication terminal having a wireless connection to a server system, comprising: a web browser management unit for generating and managing a graphic user interface which displays the index of services supplied by said server system; a real time
20   operating system for managing application programs for processing video and audio data, provided by said server system; and a network application program virtual machine for executing network application programs provided by said server system.
25

A power save management unit is preferably provided for operating only hardware for watching calls from an external system when no other functions are in progress, to minimize power consumption.
30

The graphic user interface generated by said web browser management unit may display services provided by said server system in a document written in hypertext markup language (HTML).
35

The graphic user interface generated by said web browser management unit may display services provided by said server system in a document written in hyper dynamic markup language (HDML).

Said real time operating system may comprise: a real time processing kernel for managing tasks by non-preemptive task scheduling; a network management unit for managing a network protocol stack; an input/output management unit for managing data input and output via an input/output device installed in said mobile communication terminal, by interrupt and DMA control; and a file management unit for managing the storage of data in a storage device installed in said mobile communication terminal, and managing the search for data stored in said storage device.

Said network application program virtual machine (VM) is preferably a Java VM, and said network application programs are Java applets.

The network protocol stack in said network management unit may include a point to point protocol (PPP).

The network protocol stack in said network management unit may include a transmission control protocol/internet protocol (TCP/IP).

The network protocol stack in said network management unit may include a user datagram protocol/internet protocol (UDP/IP).

Said input/output management unit may include an input/output library for keyboard input and LCD/VGA display.

Said file management unit preferably supports searching, opening, reading and writing of the files stored in said storage unit, and also searching, opening, reading and writing of files stored in a remote computer system by access through said network management unit.

Said network application program virtual machine preferably receives support from said network management unit, said input/output management unit and said file management unit to execute network application programs.

For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings, in which:

Figure 1 is a block diagram showing the configuration of a mobile video system;

Figure 2 shows the configuration of a mobile computing system;

Figure 3 is a block diagram showing the configuration of a software platform of a mobile communication terminal according to an embodiment of the present invention; and

Figure 4 is a block diagram showing the configuration of a mobile communication terminal according to an embodiment of the present invention.

Referring to Figure 1, a mobile video system based on H.324 and H.323 standards includes audio and video codecs 100 and 110, a multiplexer/demultiplexer (MUX/DEMUX) 120, a system controller 130, a modem 140 and a radio frequency (R/F) interface 150.

An audio signal input via a mike 170 or a video signal input through a camera 174 is converted to digital data and compressed by the audio or video codec 100 or 110. The compressed digital audio and video data is time-division multiplexed by the MUX/DEMUX 120, and then transmitted to another system via the mobile modem 140, the R/F interface 150 and an antenna 160. Meanwhile, video and audio data input via the antenna 160, the R/F interface 150 and the mobile modem 140 is divided into digital video and audio data, by the MUX/DEMUX 120. Then, the digital video data is restored to a video signal by the video codec 110 and displayed on a monitor 176, and the digital audio data is restored to an audio signal by the audio codec 100 and output through a speaker 172.

The system controller 130 has system software including a protocol stack, and controls the operation of the audio and video codecs 100 and 110, the MUX/DEMUX 120 and the mobile modem 140.

Referring to Figure 2, a mobile computing system has the following structure. A server system 200 installed in an office or home and several terminal systems 210, 220 and 230 are interconnected with wires to form a LAN. Here, connecting equipment 202 for wireless communications is also provided to the LAN or the server system 200. A user can use a mobile terminal (e.g., a notebook computer, etc.) 240 with connecting equipment 242 for wireless communications in areas other than the office or home by connecting the mobile terminal to the LAN. In this case, the mobile terminal is same as any other network computer system provided with a general operating system, except that it is connected to the LAN by the wireless system instead of by cables.

Referring to Figure 3, a software platform of the mobile communication terminal according to an embodiment of the invention is shown. The terminal has a wireless connection to the server system, and is comprised of a web browser management unit 300, a real time operating system 310, a network application program virtual machine 320 and a power save management unit 330.

The web browser management unit 300 generates and manages a graphic user interface for displaying the index of services provided by a server system. The graphic user interface displays services provided by the server system, as a document written in a hyper text markup language (HTML) or hyper dynamic markup language (HDML), enabling a user to select one of the services.

The real time operating system 310 manages an application program for processing video and audio data provided by the server system, and includes a real time processing kernel 312, a network management unit 314, an input/output management unit 316 and a file management unit 318. The real time processing kernel 312 manages tasks by non-preemptive task scheduling. The network management unit 314 manages a network protocol stack including a point to point protocol (PPP), a transmission control protocol/internet protocol (TCP/IP) and a user datagram protocol/internet protocol (UDP). The input/output management unit 316 manages data input and output to an input/output device of a mobile communication terminal by interrupt and DMA control, and includes an input/output library for keyboard input and LCD/VGA display. The file management unit 318 manages the storage of data in a storage unit installed in the mobile communication terminal, and manages searching for the data stored in the storage unit. The file management unit 318

supports searching, opening, reading and writing of the files stored in the storage unit. The file management unit 318 also supports searching, opening, reading and writing of files stored in a remote computer system, by

5   access through the network management unit 314.

The network application program virtual machine 320 receives support from the network management unit 314, the input/output management unit 316 and the file management

10   unit 318, and executes network application programs provided by the server system. Here, it is preferable that the network application program virtual machine 320 is a Java virtual machine, and that the network application programs are Java applets.

15

The power save management unit 330 minimizes power consumption by operating only hardware for watching calls from an external system when no other functions are in progress.

20

A menu, which is provided by a service provider using the server system and can be selected by a user on the graphic user interface, includes the following three types of services.

25

First, document-based data services (e.g., news, electronic mail, weather forecast, stock information, etc.) are included. At this time, the server system of the service provider transforms web site information

30   filtered in advance into an HTML/HDML document suitable for a display in the remote mobile communication terminal, and then transmits the transformed document. The above transmitted document is parsed by the web browser management unit 300 via the network management unit 314 of

the mobile communication terminal, and then the parsed document is displayed.

Second, native services, which are performed only in the mobile communication terminal not in a general network computer, are included. Such services include videoconferencing, an internet phone, and a discriminated service provided by the service provider to the mobile communication terminal. If a user requests the above services, the server system of the service provider transmits the necessary software code to the mobile communication terminal. The software transmitted to the mobile communication terminal is performed by the real time operating system 310 excluding the network application program virtual machine 320. Therefore, the mobile communication terminal performs a service terminal function such as the video conference or the internet phone.

Third, services performed in a network computer and written as Java applets, (e.g., a wordprocessor, a personal information manager, games, etc.) are included. If a user selects the above service from the indexed graphic user interface menu of the mobile communication terminal, the server system of the service provider transmits a corresponding Java applet. The Java applet transmitted to the mobile communication terminal is executed by an interpreter in the Java virtual machine.

Referring to Figure 4, a mobile communication terminal according to an embodiment of the present invention includes a main processing unit 400, a R/F communication unit 410, an input unit 420, a video output unit 430 and an audio input/output unit 440.

The main processing unit 400 is comprised of a microprocessor 402 and a main memory 404 for storing programs and data to be processed by the microprocessor 402. In the mobile communication terminal the main
5   processing unit 400 mounts the software platform of Figure 3, and executes application programs and network application programs, each for processing video and audio data, downloaded from the server system. Thus, the main processing unit 400 requires a microprocessor, that is
10   smaller than that of the mobile terminal 240 in the mobile computing system of Figure 2, and a main memory having smaller capacity.

     The R/F communication unit 410 connected to the main
15   processing unit 400 includes a wireless modem 412 and an antenna 414, and communicates with a server system by wireless communication.

     The input unit 420 connected to the main processing
20   unit 400 receives instructions from a user and includes a keyboard 422 and a mouse 424.

     The video output unit 430 outputs video data processed by the main processing unit 400. In the mobile
25   communication terminal, it is preferable that the video output unit 430 includes a LCD display 432 to reduce its volume. A video codec 434 for processing video data such as a video conference, etc., is also included in the video output unit 430 together with the LCD display 432.
30

     The audio input/output unit 440 includes a mike 444 for receiving sound from a user, a speaker 446 for outputting sound, and an audio codec 442 for converting an audio signal to digital audio data or converting digital

audio data received from the main processing unit 400 to an audio signal.

The mobile communication terminal can execute user application programs received from a network, as well as perform functions provided by an existing mobile video phone, by restrictedly combining the open system architecture of a wireless network computing system with the mobile video phone. Thus, a small, economic mobile communication terminal can be realized.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any

novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A mobile communication terminal having a wireless connection to a server system, comprising:

5   a main processing unit for receiving application programs and network application programs each for processing video and audio data from said server system, and for executing the downloaded programs;

10   an R/F communication unit which is connected to said main processing unit and includes a wireless modem and an antenna, for communicating with said server system by wireless communication;

15   an input unit connected to said main processor, for receiving instructions from a user;

          a video output unit for outputting video data processed by said main processing unit; and

20

          an audio input/output unit for receiving sound from a user, generating digital audio data and transmitting the digital audio data to said main processing unit, and receiving digital audio data from said main processing
25   unit and generating and outputting sound.

2. The mobile communication terminal as claimed in claim 1, wherein said main processing unit comprises:

30   a microprocessor; and

          a main memory for storing programs and data to be processed by said microprocessor.

3. The mobile communication terminal as claimed in claim 1 or 2, wherein said input unit includes a keyboard and a mouse.

5 4. The mobile communication terminal as claimed in claim 1, 2 or 3, wherein said video output unit includes an LCD display and a video codec.

5. The mobile communication terminal as claimed in claim 10 1, 2, 3 or 4, wherein said audio input/output unit includes a microphone, a speaker and an audio codec.

6. A mobile communication terminal substantially as herein described with reference to Figure 4.

15

7. A software platform of a mobile communication terminal, operating a mobile communication terminal having a wireless connection to a server system, comprising:

20 a web browser management unit for generating and managing a graphic user interface which displays the index of services supplied by said server system;

a real time operating system for managing application 25 programs for processing video and audio data, provided by said server system; and

a network application program virtual machine for executing network application programs provided by said 30 server system.

8. The software platform of a mobile communication terminal as claimed in claim 7, further comprising:

a power save management unit for operating only hardware for watching calls from an external system when no other functions are in progress, to minimize power consumption.

5

9. The software platform of a mobile communication terminal as claimed in claim 7 or 8, wherein the graphic user interface generated by said web browser management unit displays services provided by said server system in
10 a document written in hypertext markup language (HTML).

10. The software platform of a mobile communication terminal as claimed in claim 7, 8 or 9, wherein the graphic user interface generated by said web browser
15 management unit displays services provided by said server system in a document written in hyper dynamic markup language (HDML).

11. The software platform of a mobile communication
20 terminal as claimed in any of the claims 7 to 10, wherein said real time operating system comprises:

a real time processing kernel for managing tasks by non-preemptive task scheduling;

25

a network management unit for managing a network protocol stack;

an input/output management unit for managing data
30 input and output via an input/output device installed in said mobile communication terminal, by interrupt and DMA control; and

a file management unit for managing the storage of
35 data in a storage device installed in said mobile

communication terminal, and managing the search for data stored in said storage device.

12. The software platform of a mobile communication terminal as claimed in any of the claims 7 to 11, wherein said network application program virtual machine (VM) is a Java VM, and said network application programs are Java applets.

13. The software platform of a mobile communication terminal as claimed in claim 11, wherein the network protocol stack in said network management unit includes a point to point protocol (PPP).

14. The software platform of a mobile communication terminal as claimed in claim 11 or 13, wherein the network protocol stack in said network management unit includes a transmission control protocol/internet protocol (TCP/IP).

15. The software platform of a mobile communication terminal as claimed in claim 11, 13 or 14, wherein the network protocol stack in said network management unit includes a user datagram protocol/internet protocol (UDP/IP).

16. The software platform of a mobile communication terminal as claimed in claim 11, 13, 14 or 15, wherein said input/output management unit includes an input/output library for keyboard input and LCD/VGA display.

17. The software platform of a mobile communication terminal as claimed in claim 11, 13, 14, 15 or 16, wherein said file management unit supports searching, opening, reading and writing of the files stored in said storage unit, and also searching, opening, reading and writing of

files stored in a remote computer system by access through said network management unit.

18. The software platform of a mobile communication terminal as claimed in claim 11 or any of claim 13 to 17, wherein said network application program virtual machine receives support from said network management unit, said input/output management unit and said file management unit to execute network application programs.

19. A software platform substantially as herein described with reference to Figure 3.

Application No: GB 9816331.4   **Examiner:** Nigel Hall
Claims searched: 1-6   **Date of search:** 18 January 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

    UK Cl (Ed.Q): H4L (LDA, LDLX, LDPP, LECX)

     Int Cl (Ed.6): H04M 1/72; H04N 7/14; H04Q 7/22, 7/32

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	WO 96/35288 A1 (SIEMENS)	1-3

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